CHAPTER 4. MITIGATION OPPORTUNITIES AND POTENTIAL

As was presented Chapter 3, the La Plata River valley has been subjected to both natural disturbances and human-induced perturbations during the past century. Large floods near the beginning of the 20th Century modified the character of the La Plata River and its associated riverine and riparian-wetland ecosystem. Smaller floods and natural readjustment processes have directed the river system toward a narrower, more meandering state with a concomitant floodplain widening during the past 50 years. However, readjustment of the riverine and riparian-wetland ecosystems has been limited by livestock grazing, removal of native woody vegetation, river channelization, and the introduction of non-native plants. Therefore, these ecosystems are functioning less optimally than if there were no human interferences.

This chapter first introduces six mitigation measures that could be undertaken to improve the riverine and riparian-wetland ecosystems in the La Plata River study area. The mitigation measures have differing levels of intervention, management effort and cost, and they range from simply eliminating livestock grazing to complete reconstruction and restoration of the river and riparian-wetland environments. Following sections then address the potential for using these various measures at the subject properties within the study area. A summary of potential mitigation results from property acquisition and the implementation of the various measures is also provided.

4.1 POTENTIAL MITIGATION MEASURES

4.1.1 Elimination of Livestock Grazing

The study area has been affected by cattle and sheep grazing for more than 100 years. On the La Plata River and throughout much of the western United States, Anglo American introduction of livestock began during the latter part of the 19th century. Thereafter ensued a period of vegetation change and stream channel incision often termed the "arroyo problem." Although livestock grazing cannot be unequivocally attributed as the underlying cause of turn-of-the 20th Century channel incision on the La Plata River or other western rivers, recovery to equilibrium conditions and bank stability have undoubtedly been affected by historical and ongoing grazing practices and conversion of native vegetation to livestock pasture (Figure 4-1). Initial field studies have shown young cottonwood trees and willows reduced in size and numbers, introduction of non-native plants in heavily grazed areas, riverside pastures instead of willow thickets, and riverbank trampling. The lack of mature woody vegetation along river banks has accelerated lateral erosion and channel widening and provides no overhanging bank cover necessary for good fish habitat. Likewise, habitat has been reduced for bald eagle, southwestern willow flycatcher, neotropical migratory birds, and other terrestrial wildlife because of the decrease in large-sized trees and shrubs. All resources could benefit by eliminating livestock grazing and allowing the riverine and riparian-wetland ecosystems recover.

Figure 4-1. —Cattle present on overgrazed pasture located on the low-terrace subzone. Note the lack of roots in the eroded riverbank.

For certain reaches, the elimination of grazing from the study area may be all that is required for ecosystem recovery. Riparian-wetland vegetation often responds quickly to changes in land use management. An initial period of monitoring after livestock removal would provide confirmation of the potential success of this mitigation measure. The recovery of native vegetation should help stabilize riverbanks and eventually result in a narrower, deeper channel with better fish habitat, although stream morphology would likely recover more slowly compared with the recovery of riparian-wetland vegetation. An exact quantification of the extent and rate of ecosystem changes due to grazing elimination in the study area may not be possible, but generally the recovery of riparian-wetland plant communities and associated fish and wildlife values can be predicted with reasonable certainty. Therefore, if the study area is developed as a mitigation site, an initial interim period of no action other than livestock removal should be undertaken for selected reaches to evaluate the rate and extent of ecosystem recovery. Monitoring during the interim period would provide necessary data for implementing future actions (discussed below) under an adaptive management strategy.

The cost for the removal of livestock would be minimal. Additional fencing may be required to prevent livestock from entering the river corridor. The greatest cost would likely entail the monitoring efforts to evaluate the rate and extent of ecosystem recovery, and to determine

whether additional mitigation measures (as described in the following sections) would be warranted.

In summary, elimination of livestock grazing appears to have the greatest potential for improving all resources in the study area with relatively little management effort and costs. Although riparian-wetland vegetation would be most obviously and immediately improved, fish and wildlife values would also benefit in the long term:

- The structural diversity and density of riparian-wetland plant communities would be greatly improved
- Re-establishment of mature streamside vegetation and the elimination of bank trampling caused by livestock would greatly reduce lateral erosion and improve bank stability
- Development of a narrower, more stable stream channel due to greater bank stability
- Improved channel stability and re-establishment of mature streamside vegetation would improve fish habitat
- Recovery of mature cottonwood and willow stands would improve potential habitat for bald eagle and southwestern willow flycatcher
- Neotropical migratory bird habitat, as well as habitat for raptors, game birds, small mammals, reptiles, and amphibians, would also be improved by the recovery of cottonwood, willow and other riparian-wetland plant communities
- Increased browse and grasses would become available to big game animals

4.1.2 Temporary Fish and Wildlife Habitat Structures

Because of the uncertainty regarding length of time for natural ecosystem recovery, temporary measures could be undertaken to improve fish and wildlife habitat more rapidly than unassisted recovery. These measures would be relatively inexpensive to implement and would have low maintenance costs and could consist of the following:

- Enhancing stream habitat. These measures would include placing root wads and boulders, and redirecting flow with inverted-v weirs at selected locations to improve pool/eddy habitat and provide overhanging cover. Certain river reaches are more amenable to these measures than others, particularly areas where the river flows against the valley wall and contains large sandstone boulders.

- Creating artificial nesting habitat. Opportunities exist for developing nest boxes for a variety of birds.

Implementation of any these measures could begin immediately after the acquisition of property titles or easements. Alternatively, based upon initial ecosystem recovery during an interim period, measures could be selected to enhance resource components that are recovering slowly.

4.1.3 Individual Plantings and Removal of Non-native species

Throughout much of the study area, individual plantings could be made to provide temporary habitat improvements in a manner similar to using artificial habitat structures as described above. Ecosystem recovery would, however, be speeded by proper use of native plant materials. Plantings that could provide more immediate habitat improvement than natural recovery and grazing removal alone could include:

- Woody, streamside vegetation. Planting woody, streamside species (e.g., cottonwoods, willows, alders) could allow for a more immediate stabilization of river banks and re-establishment of overhanging cover for fish habitat. Many wildlife species would also benefit from such plantings.

- Cottonwood trees. Large, individuals or clusters of cottonwood trees could be planted at select locations within the floodplain or low terrace subzones where depth to water table is appropriate for the size of tree planted; pole plantings might be most appropriate in some situations. In areas where the water table is at greater depth, it may be necessary to irrigate trees until their roots extend down to the water table. Additionally, fencing may be required to protect planted cottonwoods until they reach a size to be unaffected by wildlife (e.g., beaver, deer, elk). Potential habitat for bald eagle would be most improved by cottonwood plantings at dispersed locations within the study area.

- Removal of undesirable non-native plants. Undesirable non-native plants such as tamarisk, spotted knapweed and thistle, could be readily treated in problem areas.

Similar to installing temporary artificial habitat structures, implementation of any of the vegetation planting/removal measures could begin immediately after property acquisition. Alternatively, they could be delayed and implemented as part of an adaptive management strategy once recovery directions and rates are ascertained. Costs for implementing and maintaining these measures would be relatively inexpensive. Installing temporary irrigation at certain locations may be necessary.

4.1.4 Expansion of Native Fish Habitat

The measure of success of fishery restoration on the La Plata River can be demonstrated only by an increase in numbers of native fish (especially roundtail chub) through an expansion of occupied habitat and expansion of existing populations. Currently, the only known population of roundtail chub on the La Plata River occurs about two miles downstream of the study area, with scattered individuals reported as far upstream as the confluence of Long Hollow. Presumably, lack of suitable habitat is the primary factor limiting the presence of roundtail chub within the study area. Restoration of channelized river reaches in Segment III below Long Hollow (as described in the following section) could allow individuals of the downstream roundtail chub population to emigrate and populate the restored reach and provide for an expansion of the existing population. Although expansion of the existing roundtail chub population is a desirable goal, establishing a second population segment upstream of Long Hollow would enhance the preservation potential of the species in the La Plata River, particularly in the event of a catastrophe, such as a spill of toxic materials into Long Hollow.

An approximately 1-mile long stretch of river in Segment II, including all of reach 7 and the upper quarter of reach 8, has excellent potential for habitat improvement to establish a second roundtail chub population (Figure 4-2). Property control along this stretch of river is primarily Taylor and SUIT, with Huntington controlling a short section at the upper end. Suitable habitat for roundtail chub already occurs in two short segments at the upstream and downstream ends of

Figure 4-2. —Potential area for the establishment of a roundtail chub population above the Long Hollow confluence in Segment II, reach 8.

this section of river. In these locations, the river erodes into low terrace, high terrace-alluvial fan, or the valley wall and exposes large sandstone boulders that provided lateral and overhead cover that create several contiguous pool/eddy complexes. The intervening stretch of river has swift runs and riffles, with few pools and little overhanging bank cover, but offers good recovery potential.

Apparently, recent grazing pressure has been less intensive, resulting in improved streamside vegetation and bank stability compared with majority of the study area. The area could be a model for ecosystem recovery elsewhere within the study area. Temporary overhanging cover would probably be necessary because the streamside vegetation has not yet reached maturity.

The potential for improving habitat and developing a new roundtail chub population in this portion of the La Plata River cannot be fully implemented without the removal of livestock grazing. Recent and current grazing practices throughout most of the study area have virtually eliminated stands of mature trees along the riparian corridor and prevented new growth of cottonwood trees and willows from achieving suitable size to contain the stream course and create pool/eddy complexes with overhanging bank cover. However, because this "natural" recovery of the riparian vegetation may take many years, more immediate actions are warranted to restore and enhance roundtail chub habitat.

The best opportunities for habitat improvement are in the two short end sections where some habitat already occurs. The habitat in these areas can be enhanced and perhaps expanded by placing large root wads and additional boulders along the stream bank to create pool/eddy complexes. Additional habitat enhancement in the intervening reach can be made by placing large root wads along contiguous stream banks. Large trees with root wads and overhanging branches would deflect river currents and form scour pool and eddy habitat and overhanging cover. This type of enhancement can be accomplished with a minimum of labor and cost. Large boulders are not recommended for creating fish habitat except in those sections where some boulders are already exposed as this material is not native to most of the stream corridor.

Improving habitat within and between these reaches would provide habitat above Long Hollow for a second population segment. These reaches have not been sampled for fish, but if roundtail chub presently occur in these reaches, establishing a second population segment is certainly feasible. If roundtail chub do not presently occur in these reaches, fish should be transferred from the downstream population, but the chances for success cannot be evaluated since stockings with wild or hatchery roundtail chub have not been conducted. Use of hatchery fish is not recommended in this situation.

In summary, development of a second roundtail chub population on the La Plata River upstream from Long Hollow could enhance survival of that species on the river. An approximately 1-mile section of river in Segment II could be the locus for a new, secondary population. Development of this population and essential habitat conditions would entail:

- Eliminating grazing to allow streamside vegetation to mature
- Enhancing and/or creating pool/eddy complexes with the placement of native rootwads and boulders
- Providing temporary overhanging cover with the use of native vegetation
- Possibly transferring roundtail chub from the downstream population if there currently are no individuals in the proposed second population area.

4.1.5 Creation of Riparian-Wetlands on the Low Terrace Subzone

As discussed in Chapter 3, the low terrace subzone component is not frequently flooded and is elevated several feet above the water table compared with the channel-bar and floodplain subzones. Therefore, this geomorphic surface bears vegetation transitional to the upland ecosystem with older, deeper-rooted cottonwood trees being the principle riparian species. Nearly 37 percent of the zone of influence (150 of 407 acres) is low terrace subzone. Conversion of at least parts of the low terrace subzone to a more mesic condition would be possible through two options.

One option would be to apply irrigation water to these areas by developing a water supply and water distribution system. A water supply would be developed either from ground water or the La Plata River with distribution to irrigated sites via pipeline or canal system. Various ponding configurations, water depths, and inundation times could be implemented depending upon the specific goals sought for the created riparian-wetland area. Problems of this type of creation include the necessity to acquire a water right, a high long-term maintenance requirement with ongoing costs, and development of a less than natural ecosystem environment.

An alternative option would be undertaken by removing the upper part of the terrace deposit to lower its surface, thereby allowing occasional flooding and reducing depth to the water table to allow subirrigation. This option can in some respects be considered the speeding up of the process of terrace erosion and floodplain construction. If the La Plata River remains at its current level for an extended time, its future lateral movements could eventually erode much of the low terrace subzone, a process that is presently occurring along the river. Undertaking this approach would entail earth removal and lowering the low terrace by three or more feet to floodplain level, with even greater lowering to create artificial oxbows in some locations. It could be possible to create side channels from the main river channel and create flow through wetlands or ponds. Soil amending, reseeding, and artificial plantings would be needed to speed vegetation recovery. This

measure could be employed at locations within all three river segments. Unlike developing an irrigation distribution system on the terrace, this option would require no ongoing maintenance. However, this would be an expensive option as 5,000 or more cubic yards of material would need to be moved per acre of riparian-wetland area created, costing up to $30,000 per acre to design, construct, maintain and manage. The water right issues associated with increasing the subirrigated area along the stream are uncertain.

4.1.6 Holistic Stream Channel and Riparian-Wetland Restoration

The La Plata River in Segment III has undergone significant changes within the past century, due to natural channel straightening and incision, in response to large floods and human actions of channel relocation, bank modification, channel straightening, levee construction, and bridge crossings. Because of these substantial changes, Segment III offers the greatest opportunity within the study area for corrective actions through restoration of the river channel and associated riverine and riparian-wetland ecosystems.

Restoration of this area would require reestablishing a sinuous or meandering plan form channel with a pool and riffle habitat. The channel would be integrated into a newly constructed floodplain, allowing overflow onto the floodplain to occur on a relatively frequent basis. Overflow of flood flows onto the floodplain would allow energy dissipation of high flows thereby preventing channel destruction, and would also provide the environmental conditions necessary for recruitment of certain native plant species. Revegetation of the channel banks and floodplain would be undertaken as part of the restoration process. Using a less affected downstream segment as a template, the restoration concept illustrated in Figure 4-3 has been developed for the La Plata River (BIO/WEST 1996). The concept is a generalization only and will need to be revised to meet specific topographic, hydrologic, and sedimentologic conditions of Segment III.

Restoration of this part of the study area will improve both the riparian-wetland and riverine ecosystems. As it currently exists, the riparian-wetland ecosystem has poor vegetation density and diversity and invading species (tamarisk). Vegetation improvement will enhance wildlife habitat and improve long-term channel stability. However, because of close proximity to Highway 140 and other human disturbances, cottonwoods that become re-established in this area may not provide significant value to bald eagles. River restoration of Segment III may also allow roundtail chubs from the population 2 miles downstream to emigrate and populate this segment. Because mark-recapture data indicate that fish from the downstream population ascend into this river segment, establishing suitable and occupied habitat would constitute an expansion of the existing downstream population.

Reconstruction of the river channel and the physical restoration of riverine and riparian-wetland habitats would be the most costly of the mitigation measures: It costs more than $100,000 per river mile to design, reconstruct, revegetate, maintain, manage, and monitor the river channel.

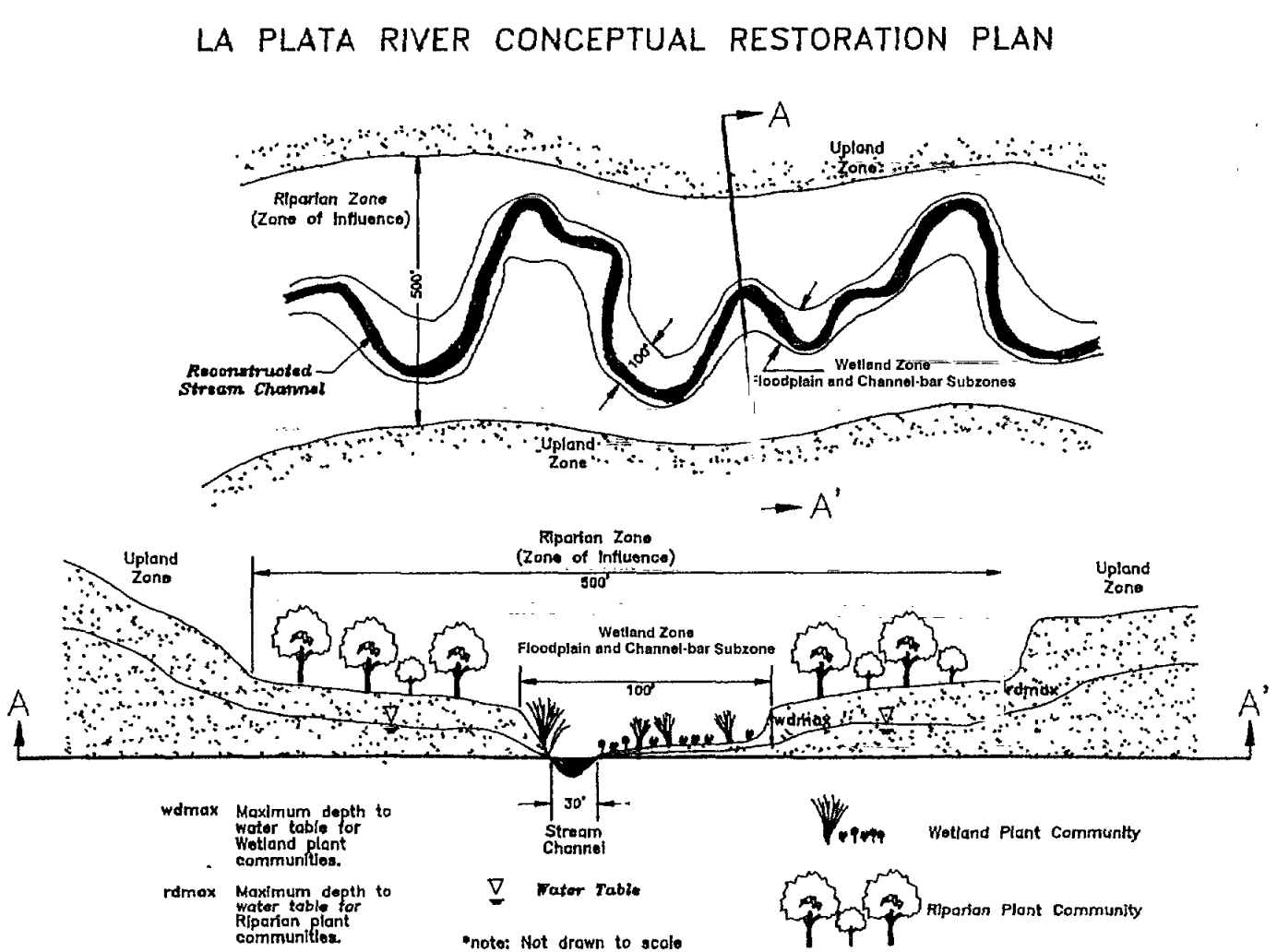

Figure 4-3. —Conceptual plan for restoring channelized reaches of the La Plata River and its associated riparian-wetland ecosystem.

4.2 HUNTINGTON PROPERTIES

4.2.1 Riparian-Wetlands

Eliminating grazing would provide the major benefit to the riparian-wetland ecosystem on the Huntington Properties, particularly those lands in Segment I (northern and central parcels) where the channel-bar and floodplain subzones occupy about 110 acres of the valley floor. Reduction or elimination of non-native tamarisk and pasture plantings would enhance recovery of native plant species. Plantings of specific species could be undertaken to provide a local seed stock for more rapid recovery of those species.

Segment II lands within the southern parcel generally have a better riparian condition than those of Segment I. Less steep valley slopes, a higher percentage of silt-clay sediment in the rivers banks, and possibly areas of less intense grazing activity have allowed quicker recovery of the channel and riparian zone. Grazing reduction would enhance riparian-wetland conditions.

Much of the southern parcel, which is located in Segment III, has been affected by channelization and bank reconstruction activities. These activities have had major effects upon both the stream channel and the riparian-wetland area. Vegetation cover is low in this parcel due to the rather recent human perturbations. Although natural recovery of this parcel is possible, a channel reconstruction integrated with the restoration of the riparian-wetland ecosystem, would provide the greatest immediate benefit. Approximately 50 acres of channel-bar and floodplain land could be dramatically improved with such a reconstruction.

Major riparian-wetland creation could be undertaken within the approximately 110 acres of low terrace subzone on the Huntington Property. This area is essentially upland ecosystem, although cottonwood trees on this terrace derive their water supply from the underlying alluvial aquifer. Either of the two previously-described approaches to wetland construction could be undertaken.

4.2.2 Fisheries

Habitat within the northern Huntington parcel is fair to good for speckled dace and bluehead sucker, but poor for roundtail chub and flannelmouth sucker. Recent and current grazing practices have reduced the abundance of pool/eddy complexes and overhanging bank cover. A program of grazing elimination would eventually allow the redevelopment of a better river habitat. However, because riparian vegetation and stream recovery will require a period of years, more immediate actions are warranted to restore and enhance native fish habitat. Habitat for roundtail chub could be enhanced locally with root wads and boulders to create pool/eddy complexes, the best potential for this enhancement is in and around a short section where the river abuts the valley wall. This habitat could be enhanced and expanded by proper placement of additional boulders and root wads to stabilize banks and create overhanging cover, and by installing inverted "V" weirs to direct stream energy.

The central Huntington parcel has good habitat for speckled dace and bluehead sucker, and fair habitat for flannelmouth sucker. Habitat for roundtail chub is poor, except for one short section where the stream flows against the valley wall. Habitat in the section along the valley wall could be more completely enhanced as described above for a similar valley wall section. Additionally, this section of river is only 0.6 mile upstream from another section of good roundtail chub habitat in the southern parcel of the SUIT lands. Developing a contiguous habitat between these two sections would provide nearly 1 mile of good roundtail chub habitat for a potential second population of roundtail chub.

The southern Huntington Parcel has fair habitat for speckled dace and flannelmouth sucker and poor habitat for roundtail chub. Because the river in this property has been channelized, there is little opportunity for habitat enhancement. However, the section does have excellent potential as a stream restoration site. The channel would need to be reconstructed to a meandering configuration and fish habitat could be created accordingly. This section has good potential for success in expanding the existing La Plata River population of roundtail chub.

4.2.3 Wildlife

The Huntington parcels have significant potential for wildlife enhancement. In particular, neotropical bird habitat could be improved, as could habitat for small mammals, reptiles, and amphibians. The Huntington parcels have considerable potential for enhancement of avian species for nesting as well as during migration and wintering periods. Benefits to big game, in particular mule deer, would result but would not be significant. Overall, the property if managed for wildlife would have significant benefits to wildlife. Most important, the importance of restoring and protecting relatively large reaches of streams and their riparian corridors cannot be understated, particularly in an area where human development is occurring at a rapid rate. Without acquisition and management, it is projected that the La Plata River lands will eventually be subdivided and infringed on by residential/ranchette growth. Under this projection, wildlife values would be expected to decrease from existing conditions.

The primary component of wildlife enhancement would consist of habitat improvement by increasing plant species variety, plant density, and the number of plant age classes, particularly older age classes. Grazing elimination would provide the principal means of habitat improvement. If needed, plantings could be made in selected areas. Habitat values for many species could also be gradually enhanced through a program of weed control that targets species such as knapweed and tamarisk. Desired age classes of cottonwoods would be managed with snags preserved. Plantings of native food-producing shrubs and forbs could also be undertaken. Opportunities also exist for developing nest boxes for a variety of birds. In addition to vegetation cover enhancement, commitments to limit recreation and other uses that conflict with wildlife values would also need to be made.

Livestock elimination would increase browse and grasses available to big game animals; resident deer numbers would be expected to increase and it is possible that more winter use of the area

would occur. The area would not be expected to become a significant elk wintering area, but land use trends in the general area may force these animals into areas such as the Huntington parcels in future years. Conversion of winter ranges on private lands to residential and other uses in the future may result in unexpected use patterns by big game. The La Plata drainage may remain as a migration corridor from summer ranges and this fact may increase the value of the Huntington parcels in the future.

Non-riparian areas of the Huntington Property outside the river valley could be improved by long-term grazing control associated with weed control, restoration of unneeded roads, and possibly some vegetation manipulation. Although upland areas are not the key focus of the property acquisition, they could be improved for wildlife and would also serve as a buffer zone for the riparian areas. In these areas fencing would be a key development. A system of artificial water tanks, such as guzzlers, could be very cost effective methods of increasing diversity, populations, and improving distribution of wildlife.

4.2.4 Threatened and Endangered Species

The Huntington parcels afford a unique location, visually and thermally protected by adjacent mesas. Presently, three communal wintering bald eagle roost sites are known to occur on the property, and willow flycatchers are known to have used the area. Potential to maintain and enhance these parcels for both the bald eagle and southwestern willow flycatcher is dependant on habitat improvement. Management practices that would enhance vegetation are the central element of threatened and endangered species population expansion. Grazing elimination is therefore essential. Bald eagle roost trees must be protected from woodcutting, fire, or other actions that would prematurely down them. Snags must be preserved. Planting cottonwood trees will be necessary to replace the stand.

Without the purchase of the Huntington parcels, development is likely with the attendant loss of bald eagle roost sites. This is what occurred to a former roost site downstream near Pioneer Ditch. In the winter of 1993-1994 as many as 15 bald eagles were counted at this site. Houses were built the following summer and bald eagles have not been seen at that site during surveys since the houses were constructed.

4.3 SOUTHERN UTE INDIAN TRIBAL LAND

4.3.1 Riparian-Wetlands

The two parcels of SUIT land have had a history of both natural disturbance and human-induced perturbations similar to that of the Huntington Property. However, the river in these parcels shows no sign of river channelization, but grazing activity has been heavy. Removal of grazing would allow nearly 50 acres of channel-bar and floodplain riparian-wetland to significantly recover. A total of approximately 39 acres of low terrace subzone could have its riparian plant communities enhanced.

4.3.2 Fisheries

Habitat within the northern SUIT parcel was fair to good for speckled dace and bluehead sucker, but because of extensive livestock grazing and trampling of stream banks, there appears to be little opportunity for habitat enhancement. The channel in this reach would require extensive restoration before fish habitat could be improved. Nevertheless, reduction or removal of grazing pressure could help the stream recover. Habitat within the southern SUIT parcel is slightly better, but there is erosion and extensive livestock trampling and an absence of large woody vegetation. A short section could provide good roundtail chub habitat with enhancement measures of proper placement of root wads, boulders, and inverted "V" weirs. As described above, using habitat improvement to connect this section with a section of roundtail chub habitat on the Huntington Property would provide about one mile of enhanced roundtail chub habitat.

4.3.3 Wildlife

Opportunities for wildlife on the SUIT lands are similar to those described for the Huntington parcels in 4.2.3. Inclusion of these lands would add significantly to the project by creating a larger block of habitat.

4.3.4 Threatened and Endangered Species

Because the SUIT lands adjoin the Huntington parcels, activities on them directly affect species on the Huntington parcels. One willow flycatcher has been detected on the northern parcel of SUIT Lands, and a bald eagle roost site is located within the southern parcel. To maximize benefits to protected species and other wildlife, a management plan would need to be devised to work in concert with actions on the Huntington parcels. Practices similar to those described in 4.2.4 are recommended to maximize the potential of the SUIT lands.

4.4 TAYLOR PROPERTIES

4.4.1 Riparian-Wetlands

These properties are essentially contained within Segment II and have existing conditions and mitigation potential similar to the Huntington Southern Parcel lands contained within that segment. Less steep slopes and a higher percentage of silt-clay sediment in the floodplain has allowed good recovery of the channel and riparian zone from turn-of-the-century flooding. Also, because parts of the Taylor valley bottom lands are somewhat less accessible to grazing, their better condition may be the result of less intense livestock intensity. Grazing reduction will somewhat enhance the wetland riparian condition on about 24 acres of channel-bar and floodplain area. About 7 acres of the low terrace subzone could be enhanced.

4.4.2 Fisheries

The Taylor Properties are within a relatively short section of stream containing fair to good habitat for flannelmouth sucker, bluehead sucker, and speckled dace. Although habitat is poor for roundtail chub, this property is adjacent to a short section of SUIT lands with good roundtail chub habitat. It may be possible to expand this habitat into the Taylor Properties through proper placement of root wads, boulders, and inverted "V" weirs.

4.4.3 Wildlife

Opportunities for wildlife on the Taylor Properties are similar to those described for the Huntington parcels in Section 4.2.3. Inclusion of these lands would add significantly to the project, creating a larger block of habitat.

4.4.4 Threatened and Endangered Species

Three willow flycatchers have been detected near the Taylor Properties just upstream from Long Hollow. The bald eagle roost site on the Huntington parcel's and SUIT land's boundary also adjoins the M & B Taylor Property. Activities recommended for both the Huntington parcels and SUIT lands would be applicable to the Taylor Properties. If all parcels of the three owners were managed in concert, it would provide maximum benefit to protected species and other wildlife as well.

4.5 BOYLE PROPERTY

4.5.1 Riparian-Wetlands

Virtually all of the Boyle property has been significantly altered from its natural state, mostly due to river channelization. Grazing removal may allow for a partial recovery of riparian-wetland plant communities over time, especially for streamside vegetation. However, the presence of tamarisk is problematic and its removal would be necessary to ensure the more desirable communities of willows and cottonwoods would become established. In total, approximately 9 acres of channel bar, floodplain, and low terrace subzones could be reconstructed for ecosystem restoration. The reconstruction would be similar to that described for the southern Huntington parcel in Segment III.

4.5.2 Fisheries

Restoration of native fish habitat would be completed similarly to that described for the southern Huntington parcel in Segment III, with similar resultant benefits.

4.5.3 Wildlife

Wildlife values would be restored in a manner similar to that described for the southern Huntington parcel in Segment III, with similar resultant benefits.

4.5.4 Threatened and Endangered Species

Mitigation measures would restore native cottonwood and willow communities at the Boyle property, thereby restoring potential habitat for both bald eagle and southwestern willow flycatcher. However, bald eagle would probably avoid the area for use as communal roosting because of its close proximity to Highway 140. In contrast, southwestern willow flycatcher would potentially use the restored habitats during migratory periods and possibly for nesting.

4.6 MITIGATION SUMMARY

Because the La Plata River corridor has been subjected to both natural disturbances and human-induced perturbations, the riverine and riparian-wetland ecosystems of the study area are at less than their potential condition. Six mitigation treatments are recommended to improve the riverine and riparian-wetland ecosystems in the La Plata River study area. Whereas one treatment would enhance all four resources considered herein, others would be more resource-specific. Table 4-1 illustrates which particular resources would be enhanced by each of the six treatment measures.

Table 4-1. —Comparison of benefits that would be associated with mitigation measures prescribed for the La Plata River corridor study area.

Mitigation Measure	Resource			
	Riparian-Wetland	Fisheries	Wildlife	Threatened and Endangered Species
1. Eliminate livestock grazing	Yes	Yes	Yes	Yes
2. Temporary habitat structures	No	Yes	Yes	No
3. Individual plantings	Yes	Yes	Yes	Yes
4. Enhance native fish habitat	Possibly	Yes	Yes	No
5. Riparian-wetland creation	Yes	No	Yes	Yes
6. Holistic restoration	Yes	Yes	Yes	Yes[1]

[1] Because of proximity to residential development and state highway in the Segment III restoration reach, improvements for bald eagle roosting will likely have limited value.

As Table 4-2 indicates, a key component of any mitigation plan should be elimination of livestock grazing from study area, as this action will benefit all resources. The adverse effects of livestock grazing have been well documented in the scientific literature, and the study area shows many of these effects. Grazing elimination would produce a cascade affect of enhancement of all resources. Recovery of streamside cottonwood trees, for example, would enhance bank stability, which would cause channel narrowing and provide better fish habitat, while simultaneously providing potential eagle roosting sites that would have greater longevity due to better channel stability. Grazing elimination would most probably provide the best overall treatment option for the ultimate recovery and renaturalization of the riverine and riparian-wetland ecosystems within the study area.

Although grazing elimination should be an essential component of resource enhancement within the study area, grazing elimination alone will not necessarily provide for a quick recovery of all resources. Vegetation recovery will be quick, but attainment of mature stands of cottonwoods may take decades, thereby making eagle habitat recovery a slow process. Likewise, changes in channel geomorphology and an associated improvement of fish habitat will take many years, with the modes and rates of change contingent upon unpredictable future hydrologic conditions. Direct intervention treatments to speed resource enhancement processes could be undertaken. However, an adaptive management strategy may prove worthwhile. Grazing elimination could be immediately undertaken, with the resource effects monitored to evaluate improvements. Areas or resources that are slow to derive benefits from grazing elimination alone could then be enhanced with the intervention treatments.

Finally, a particular problem that must be considered is that the study area valley bottom lands are currently under the control of five separate landowners. The Huntington properties cover the greatest part of the corridor, particularly at its upstream and downstream ends. The SUIT lands and Taylor properties cover a substantially smaller portion in the middle of the corridor, and the Boyle property (not discussed herein) covers a small part of Segment III. Unfortunately, the mixture of land ownerships splits the river valley "down the middle" in several instances. Without control of most or all of these properties, resource benefits may be dramatically reduced. For example, eagle nesting on one property may be adversely affected by residential development on an adjoining property. Likewise, the river provides connectivity to fluvial processes, so that bank erosion on an uncontrolled upstream property may adversely affect the channel in a reach on controlled property. Because of the patchwork of ownership along the study area, mitigation goals may not be fully achievable without cooperation and/or participation of all land holders.

A summary of mitigation potential for all resources for each property within the study area is summarized in Table 4-2.

Table4-2. —Mitigation potential for resources per property ownership within the La Plata River corridor study area.

	Huntington Properties			SUIT Lands		Taylor Properties		Boyle Property	Total
	Northern Parcel	Central Parcel	Southern Parcel	Northern Parcel	Southern Parcel	M & B	B & A		
Total land with channel bar and flood plain (Riparian-wetland restoration/enhancement potential	91.5 ac	25.0 ac	52.0 ac	34.5 ac	15.0 ac	22.0 ac	2.0 ac	6.5 ac	248.5 ac
Total land within low terrace (Riparian-wetland enhancement/creation potential)	49.0 ac	12.0 ac	40.5 ac	32.0 ac	7.0 ac	7.5 ac	0.5 ac	2.5 ac	151.0 ac
River miles (feet) for restoration/enhancement of native fish habitat	1.99 mi (10,500 ft.)	0.64 mi (3,600 ft.)	1.14 mi (6,000 ft.)	0.85 mi (4,500 ft.)	0.38 mi (2,000 ft.)	0.60 mi (3,150 ft.)	0.09 mi (500 ft.)	0.19 mi (1,000 ft.)	~7.5 mi (~41,250 ft.)
Potential for wildlife enhancement	High	High	High	High	High	High	Moderate	High	
Potential for SW Willow Flycatcher enhancement	High	High	High	High	High	High	Moderate	High	
Potential for Bald Eagle enhancement	High	High	Moderate	High	High	Moderate	Low	Low	